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THE EFFECTS OF NON-BANK FINANCIAL INTERMEDIARIES ON DEMAND FOR MONEY IN KENYA

S.M. NDELE

NOMIC RESEARCH CONSORTIUM

POUR LA RECHERCHE ECONOMIQUE EN AFRIQUE

The effects of non-bank financial intermediaries on demand for money in Kenya

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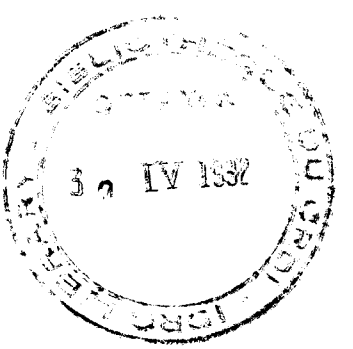

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Contents

List of tables

I. Introduction

The subject of demand for money has aroused much interest among researchers and increasingly become a focus in macroeconomic analysis. This is partly due to a realization that monetary policy will be effective if the demand for money function is stable. Stability of demand for money is important in understanding the behaviour of other critical sectors of the economy in a developing country.

Keynes' 1936 work had a great impact on the theory of demand for money function. Prior to this, such theories were based on variations of the quantity theory of money developed by David Hume in 1752.[1] Subsequent studies recognized that demand for money was not only a function of rate of interest but also of several other variables. When attention began to focus on problems of developing countries, especially after the Second World War, it became necessary to develop a framework for explaining the role of money in the development process. It was felt that expanding money supply and lowering interest rates might be good policies for countering problems of underdevelopment. Studies have, therefore, focused on explaining the relationship between demand for money and income, interest rate and expected rate of inflation.[2]

Attempts to demonstrate determinants and stability in the demand for money in Kenya are recent—the earliest study is that of Bolnick (1975). Although his study had serious shortcomings, Pathak (1981) looked at stability of the function as well as the function of money as a medium of exchange.[3] Darrat (1985) demonstrated in his study that the long-run elasticities of real money demand (M1 and M2) with respect to real income were greater than one, and the function was stable. So far, no study in Kenya has looked at the effect of the non-bank financial intermediaries (NBFI) sector on the conduct of monetary policy. In addition, it is not clear how the monetary measures adopted by the Government in the 1980s affected demand for money since earlier studies utilized Kenyan data up to the fourth quarter of 1978.

Kenya has witnessed a period of rapid growth in non-bank financial intermediaries, especially in the last half of the 1970s and the 1980s. These financial intermediaries have continued to thrive alongside the commercial banks and have now become potential competitors of commercial banks as far as credit and savings mobilization in the country is concerned. For example, in 1987/88 financial year, deposits in NFBIs grew by 7.2 percent, while bank deposits grew by 5.3 percent during the same period. It is argued in this paper that this devel-

opment in the financial intermediation must have affected the functional form of the demand for money and efficacy of monetary policy in Kenya.

The main purpose of this paper is, therefore, to investigate the effect of the rapid growth in NBFI liabilities on the demand for money and its components. Section II of the paper outlines the present growth of NBFIs. It is followed by Section III on the specifications of the theoretical model used to estimate demand for money function. Section IV presents the empirical results and a discussion of them. The paper concludes with a summary of the main findings and policy implications

II. The growth of non-bank financial intermediaries

Commercial banks in Kenya are the most important lending and deposit institutions. However, they are not the only financial outlets in the country. There are many other financial intermediaries referred as non-bank financial intermediaries (NBFIs) which range from small savings and credit associations to very large financial companies.[4] In the developed countries with well-developed financial markets these intermediaries serve as intermediaries between two groups of people. They sell a financial asset to one group and use the money generated to lend to another group. They sell financial services to the public and in turn invest the money (Luckett, 1984).

In Kenya, as in other countries, non-bank financial intermediaries supplement the commercial banks mainly in deposits and in lending out credit to potential investors.

According to the *Banking Act* in Kenya a non-bank financial intermediary is a company other than a commercial bank authorized to conduct financial business. A financial intermediary therefore accepts money deposits payable on demand or after the expiry of a fixed period or after notice of intention of withdrawal. It acts as a custodian of deposits. This definition excludes building societies and insurance companies which in some countries are regarded as financial intermediaries. Thus a NBFI is not the same as a commercial bank, even though it provides similar services.

NBFIs have witnessed a period of phenominal growth and are competing favourably with commercial banks in deposit mobilization and credit creation, as can be seen in Tables 1 and 2. Tables 1 and 2 present quarterly and annual percentage changes of assets and liabilities of commercial banks and NBFIs, respectively. Reading the first column of both tables, we notice that during the September 1988 quarter, the quarterly change of private sector deposits with NBFIs was higher than those with commercial banks in the December 1988 quarter. The annual percentage changes of NBFIs' assets and liabilities were also very high between 1987 and 1988. Further, total annual percentage share of demand deposits with NBFIs was high. However, the commercial banks attracted more deposits from Government and other public-sector depositors than NBFIs.

Table 1 Selected assets and liabilities of commercial banks

	Quarterly percent change		Annual percent change			Level in March 1989
	Dec. 1988	March 1989	March 1988	Dec. 1988	March 1989	(Sh m)
Liabilities						
Government deposits	− 22.1	+ 76.3	+ 64.7	+ 28.4	+ 85.5	3,676
Other public-sector deposits	+ 2.9	+ 17.8	+ 6.3	− 2.9	+ 14.7	2,981
Private-sector deposits	+ 8.4	+ 3.6	+ 4.0	+11.2	+ 13.6	33,819
Total deposits liabilities:	+ 5.7	+ 8.6	+ 6.4	+ 10.9	+ 17.8	40,476
of which demand*	+ 6.4	+ 9.9	+ 0.3	+ 9.5	+ 19.4	19,853
Time	+ 3.4	+ 17.1	+ 0.6	+ 17.9	+ 27.4	7,995
Savings	+ 5.9	+ 2.0	+ 21.1	+ 9.4	+ 10.3	12,628
Assets						
Government credit (net)	+ 11.0	− 10.8	− 2.4	− 39.2	− 42.4	2,941
Other public-sector credit	− 3.1	− 7.8	+ 43.3	− 2.8	− 18.2	3,169
Private-sector credit	+ 6.2	−0.1	+ 10.7	+ 19.4	+ 15.7	30,692
Total credit	+ 5.7	− 1.7	+ 11.2	+ 7.9	+ 4.3	36,802

Source: Central Bank of Kenya (1989), page 13.

* Includes seven days' notice.

Table 2 Selected non-bank assets and liabilities

	Quarterly percent change		Annual percent changes			Level in Dec. 1988
	Sept. 1988	Dec. 1988	Dec. 1987	Sept. 1988	Dec. 1988	(Sh m)
Liabilities						
Government deposits	− 3.2	+ 9.5	87.4	+ 0.2	+ 9.4	286
Other public-sector deposits	+ 1.8	+ 0.7	− 4.1	+ 3.6	+ 2.4	3,204
Private-sector deposits	+ 9.1	+ 6.9	+ 12.3	+ 18.1	+ 20.9	17,267
Total deposits liabilities:	+ 7.6	+ 5.9	+ 9.7	+ 15.2	+ 17.4	20,757
of which demand*	+ 7.2	+ 20.4	+ 64.7	+ 27.3	+ 35.7	4,420
Time	+ 8.4	+ 1.9	+ 6.3	+ 12.8	+ 13.7	15,006
Savings	+ 0.4	+ 9.8	− 29.7	+ 12.7	+ 12.1	1,331
Assets						
Government credit (net)	+ 2.3	− 17.6	− 4.3	− 0.8	− 17.9	2,438
Other public-sector credit	+ 0.8	+ 411.9	+ 24.7	− 49.0	+ 158.6	492
Private-sector credit	+ 4.8	+4.2	+ 13.0	− 21.6	+ 21.1	17,594
Total credit	+ 4.4	+ 2.9	+ 9.8	+ 16.9	+ 16.1	20,524

Source: Central Bank of Kenya (1989), page 14.

* Includes seven days' notice.

While the growth in commercial banks' lending fell between March 1988 and March 1989, that of NBFIs rose. For example, in 1988 total lending to the economy rose by 16.1 percent compared with 9.8 percent in the previous year. The NBFIs' credit to the private sector and other public sector rose by 21.1 percent and 158.6 percent respectively in 1988. Overall NBFIs lending to the private sector rose at a higher percentage between March 1985 and December 1988 than Commercial banks.[5]

NBFIs' contribution to the provision of credit has kept on improving even though it falls below that of commercial banks. NBFIs advanced credit facilities to Central Government, the agricultural sector, manufacturing, parastatals, the service sector and building and construction.

In the period under review, NBFIs' total credit has been rising, as shown by Table 3, except in 1985–1986, the period of liquidity problems. NBFIs provide long-, medium- and short-term credit. The intermediaries are popular with borrowers compared to commercial banks because they respond quickly to customer needs and are less stringent when approving loan applications.

Table 3 The contribution of commercial banks and NBFIs credit to total domestic credit (%)[a]

Year	Commercial banks	NBFIs
1973	60	13
1974	76	14
1975	69	15
1976	60	16
1977	57	14
1978	64	17
1979	61	17
1980	68	21
1981	67	26
1982	64	29
1983	65	32
1984	64	35
1985	67	30
1986	61	32
1987	59	38
1988	61	35

Source: Calculated from various *Quarterly Economic Reviews*, Central Bank of Kenya.

a. The contributions do not add to 100 because total domestic credit includes borrowing from other sectors excluded from the above calculations.

Commercial banks attracted a greater proportion of deposits from the private sector, Government and other public sector than NBFIs between 1976 and 1984. However, total NBFIs deposits grew at about 89 percent compared with com-

mercial banks' growth of 53 percent over the same period. The main reason for this is the aggressive campaign strategies adopted by NBFIs to lure depositors. These intermediaries assured depositors development credit with their savings, as well as flexible interest rates; these measures attracted many depositors. This kept NBFIs total deposits rising until they came very close to those of the commercial banks, especially between 1978 and 1979. Analysis of NBFIs deposits pattern shows that between 1973 and 1986 commercial statutory boards deposits grew by about 99 percent, those of Kenya residents by about 95 percent and by Central Government by 84 percent, respectively. The trend of deposits by non-residents is not encouraging (Table 4).

Table 4 NBFIs deposits 1973–1986 (KSh million)

Year	Central Government[a]	Commercial statutory boards	Kenya residents	Non-residents
1973	76.22	16.76	583.19	8.45
1974	70.95	96.25	648.69	1.36
1975	151.76	195.45	905.64	1.20
1976	157.12	354.98	915.74	1.73
1977	288.05	455.08	1,361.79	2.02
1978	485.90	530.58	1,808.60	2.88
1979	451.52	1,045.23	2,234.33	2.12
1980	499.36	1,350.02	3,001.47	1.68
1981	549.30	1,718.71	3,421.44	2.15
1982	644.41	2,776.47	3,753.84	1.69
1983	579.03	2,737.95	5,352.50	2.43
1984	512.84	3,223.45	8,414.14	3.21
1985	538.48	3,100.71	5,352.50	16.43
1986	465.68	2,936.40	12,707.73	5.85

Source: Central Bank of Kenya (1989).

a = Includes Local Government

The commercial banks' liquidity position improved dramatically between June 1986 and March 1987 by 12.0 percent, to about 34 percent. During the same period that of NBFIs rose slowly by 4.0 percent to about 36 percent. In addition, the liquidity ratio of NBFIs rose by 1.0 percent in March 1989 compared to the position in December 1988. At the same time, the liquidity ratio was 5.0 percent points above the minimum required by the Central Bank of Kenya. Between March 1985 and March 1989, the liquidity ratio of NBFIs was higher than the minimum ratio required except in June 1988 when it fell until almost levelling the minimum ratio which NBFIs are supposed to maintain.[6]

NBFIs were shown in this section as having exhibited a steady growth. They have significantly changed over time and are increasingly becoming similar to commercial banks. They control a sizeable proportion of the financial market—probably because their transactions are exempted from some monetary measures adopted by monetary authorities. Monetary policy in Kenya mainly focuses on commercial banks. We therefore argue that the rapid growth in NBFIs'

liabilities, as demonstrated in this section, has an impact on the conduct and effectiveness of monetary policy in Kenya. Since formulation of monetary policy depends on the stability of demand for money function, monetary measures adopted without taking into consideration actions of NBFIs are unlikely to achieve the targeted objectives. If monetary policy authorities set some targets on growth of money the contribution of NBFIs should be considered.

III. The theoretical formulation of demand for money function

Empirical studies on demand for money suggest that money could be treated as a durable consumer good (Chow, 1966) because holding of money by consumers yields services to them. Holding of money and other real goods by the consumer will depend on levels of income and prices just as in the theory of consumer behaviour. The prices of goods depend on prices of relative goods, while the price of money is determined by the rate of interest. The equilibrium demand for money is influenced by a scale variable, income, relating to the level of transactions in the economy and the opportunity cost of holding money relative to other financial assets. To explicitly specify the model, we assume that there is a stable equilibrium in the money market, given income, interest rate, opportunity cost of holding money, etc. Demand for money in non-linear functional form is specified as:

$$(1) \qquad M_t^{*d} = \alpha_0 Y_t^{\alpha_1} RI_t^{\alpha_2} \pi_t^{\alpha_3} e^{ut}$$
$$\qquad\qquad\qquad (+) \quad (-) \quad (-)$$

where M_t^{*d} = Desired real money balances at time *t*,

Y_t = Real income at time *t*,

RI_t = Rate of interest (reflects yield on financial assets) at time *t*,

π = Opportunity cost of holding money relative to other real assets,

U_t = Disturbance term.

The signs in parentheses below the variable are the expected signs as postulated by economic theory. The appropriate proxy for opportunity cost of holding money in developing countries is the expected rate of inflation.[7] Since substitution can occur between money and alternative financial assets, interest rates provide another appropriate opportunity cost variable. However, in developing countries inclusion of interest rate as a variable in demand for money functions is controversial. The reason for this is that these countries do not have a well-organized money and other financial-asset market such that substitution between

money and other assets does not occur and wealth owners are limited to holding their assets either as money or as real goods such as land, agricultural commodities, buildings, etc. (Wong, 1977). In addition, governments fix controls or ceilings on interest rates on financial assets. Interest rates, therefore, display very little variation over time, and this makes it difficult to establish empirically any relationship between money and interest rates. These arguments are applicable in Kenya and in this study the treasury bill rite is used as a proxy for rate of interest.[8]

In our model specification in equation (1), we have used both inflation and interest rate. The inclusion of both variables which are likely to be highly correlated is not a mispecification error. In developed countries both variables move in the same direction, while in developing countries, because of controls in rate of interest, the variables are expected to be uncorrelated. In Kenya interest rate has been subjected to controls by the Central Bank of Kenya. Interest rates are fixed and therefore do not adjust to pressures in the money market. Inflation is a significant variable which affects portfolio decisions of wealth-holders in Kenya. Since interest rates are fixed wealth-holders prefer to keep their wealth in real assets rather than deposit the money in a bank if they anticipate increases in inflation in future. The model performed very well when estimated using both variables.

There is a substantial empirical literature which supports the view that there exists a time lag in the adjustment of actual money stock to desired money balances. As such, the short-run demand for money should contain lagged money balances as an explanatory variable. Adjustment of money balances from the actual to the desired level is likely to be incomplete because of rigidity, inertia, ignorance, transaction costs, etc.

Since the desired stock of money is not observable we assume a money stock adjustment of the form:

$$(2)\quad \frac{M_t^d}{M_{t-1}^d} = \left[\frac{M_t^{*d}}{M_{t-1}^d}\right]^{\beta}$$

where $0<\beta<1$, β = Coefficient of adjustment of money stock.[9]
Equation (2) in log form becomes:

$$(3)\quad \ln M_t^d - \ln M_{t-1}^d = \beta\left(\ln M_t^{*d} - \ln M_{t-1}^d\right)$$

Equation (1) in log form is expressed as:

$$(4)\quad \ln M_t^{*d} = \ln \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln RI_t + \alpha_3 \ln \pi_t + U_t$$

Substituting (4) in (3) and rearranging we obtain

(5) $\ln M_t^d = \beta \ln \alpha_0 + \beta \alpha_1 \ln Y_t + \beta \alpha_2 \ln RI_t + \beta \alpha_3 \ln \pi_t +$

$(1 - \beta) \text{in } M_{t-1} + \beta U_t$

Equation (5) is the short-run demand for money function.
From equation (5) the long-run demand for money is derived by dividing through by β and dropping out M_{t-1} and is expressed as:

(6) $\ln M_t^d = \ln \alpha_0 + \alpha_1 \ln Y_t + \alpha_2 \ln RI_t + \alpha_3 \ln \pi_t + U_t$

The equation for estimating components of the money stock is specified in general form as:

(7) $A_t^i = f\ (Y_t, RI_t, \pi_t)$
$(+)\ (-)\ (-)$

where A_t^i = real stock of the i^{th} money stock at period t. Other explanatory variables are as defined earlier.[10]

A_t^i is defined as currency held by the public in real terms, demand deposits held by the public in real terms and time and savings deposits in real terms.

IV. Empirical results

In order to delineate the effect of NBFIs on the conduct of monetary policy in Kenya, equations 5 to 7 specified in the preceding section were estimated and the results are presented in Tables 5, 6, 7 and Appendices II and III. Additional results are presented in equations 3.1 to 3.6. These equations were estimated using quarterly and annual data over the period 1973.1 to 1987.4.[11] In addition, the tables contain a variety of goodness-of-fit statistics such as the adjusted coefficient of determination, the standard error of the estimated equation, the Durbin-Watson test statistic and the F-test statistic. The equations were corrected for first-order serial correlation by the Cochrane-Orcutt iterative method. A description of variables used and sources of data is found in Appendix 1. Since these tables report results for a number of equations, we discuss results with policy implications.

Short- and long-run demand for money

Tables 5 and 6 report results after estimating both short-run and long-run demand for money equation using quarterly data. The t-values of the coefficients are in parentheses with an asterisk indicating the level of significance. These equations are estimated in the log-linear functional form. The long-run money demands as reported in Table 6 were estimated independently. Normally, once the short-run demand coefficients are estimated the long-run demand coefficients are obtained by solving the short-run demands algebraically. We solved the long-run demands algebraically to test whether the estimated long-run demands were significantly different but found they were not. However, we decided to report the estimated coefficients. In the next few paragraphs we discuss together the short-run and long-run coefficients presented in tables 5 and 6.

Regressing M1 on income, opportunity cost, etc., the result is equation 1.1.1 in Table 5. All the variables have the expected signs and are therefore consistent with the theory. The constant term is significantly different from zero. Both real income and rate of interest are statistically significant at the 1 percent level. The opportunity cost of holding money relative to other assets has the anticipated sign but is statistically insignificant. The goodness-of-fit variables show that over 93 percent of the variations in demand for money in Kenya is accounted for by the explanatory variables included in this equation.

Table 5 Regression results for short-run demand functions: Quarterly data, 1973.I–1987.I

Equation number	Dependent variable	Constant	Y	π	RI	$M1_{t-1}$	MAD_{t-1}	$M2_{t-1}$	$M3_{t-1}$	$\bar{R}^2$	SEE	DW	F
1.1.1	M1	0.772	1.320	–0.018	–0.056	0.582				0.932	0.129	2.003	225.9
		(4.388)***	(4.479)***	(–0.771)	(2.543)***	(6.502)***							
1.1.2	M1AD	0.269	0.913	–0.058	–0.027		0.823			0.979	0.117	2.031	229.7
		(2.653)***	(3.343)***	(–2.716)***	(–1.399)*		(5.113)***						
1.1.3	M2	0.922	1.522	–0.018	–0.059			0.467		0.866	0.243	2.174	85.1
		(3.953)***	(4.471)***	(–0.484)	(–1.971)**			(3.915)***					
1.1.4	M3	0.627	2.121	–0.055	–0.023				0.596	0.926	0.229	2.595	207.3
		(3.309)***	(3.979)***	(–1.356)*	(–0.623)				(6.201)***				

Key

t statistic in parentheses under the coefficients

* Statistically significant at 10 % level

** Statistically significant at 5 % level

*** Statistically significant at 1 % level

Table 6 Regression results for long-run demand functions: Quarterly data, 1973.I–1987.I

Equation number	Dependent variable	Constant	Y	π	RI	$\bar{R}^2$	SEE	DW	F
2.2.1	M1	3.529	1.190	0.0004	–0.025	0.916	0.143	2.187	180.8
		(9.716)***	(2.714)***	(0.015)	(–1.002)				
2.2.2	M1AD	5.869	1.163	–0.025	–0.025	0.977	0.124	2.044	122.3
		(3.789)***	(2.764)***	(–1.243)	(–1.182)				
2.2.3	M2	1.769	1.916	0.024	–0.06	0.842	0.266	2.164	120.1
		(1.912)**	(2.612)***	(1.341)	(–2.713)***				
2.2.4	M3	1.409	1.923	0.0018	–0.004	0.885	0.288	1.873	173.0
		(8.224)***	(17.371)***	(0.037)	(–0.095)				

Key

t statistic in parentheses under the coefficients

* Statistically significant at 10 % level

** Statistically significant at 5 % level

*** Statistically significant at 1 % level

Table 7 Estimation results for components of money stock, 1973: I–1987: IV

Number of equation	Dependent variable	Constant	Y	π	RI	CAA_{t-1}	DEE_{t-1}	TSS_{t-1}	$\bar{R}^2$	SEE	DW	F
3.3.1	CAA	–0.365	1.869	–0.016	–0.181				0.722	0.322	1.991	58.9
		(–1.904)*	(12.024)***	(–0.284)	(–3.523)***							
3.3.2[a]	CAA	–0.327	1.636	–0.0003	–0.116	0.279			0.748	0.308	2.108	49.9
		(–1.717)*	(5.249)***	(–0.006	(–2.095)**	(2.425)***						
3.3.3	DEE	1.553	1.715	0.011	–0.042				0.856	0.198	1.877	133.9
		(13.184)***	(16.093)***	(0.312)	(–1.324)*							
3.3.4[a]	DEE	0.745	0.846	0.003	–0.028		0.524		0.896	0.167	2.538	143.5
		(4.005)***	(4.352)***	(0.091)	(–1.047)		(5.239)***					
3.3.5	TSS	0.407	1.054	–0.062	–0.006				0.924	0.218	1.968	273.5
		(3.143)***	(21.559)***	(–1.966)*	(–0.018)							
3.3.6[a]	TSS	0.102	2.274	–0.54	–0.018			0.805	0.988	0.084	1.902	425.8
		(1.891)*	(4.819)***	(–3.687)***	(–1.972)*			(19.077)***				

Key

a Short-run demand for money equation
t Statistic in parentheses under the coefficients
* Statistically significant at 10 % level
** Statistically significant at 5 % level
*** Statistically significant at 1 % level

The short-run income elasticity is not only positive but within the expected range for most developing countries. Except in one case, this variable is more than unity and statistically significant, indicating that real income is an appropriate explanatory variable in demand for money function in Kenya. The coefficient of lagged money balances is 0.582 and is statistically significant at the 1 percent level. The coefficient of adjustment is $\beta = 1 - 0.582$ and indicates that about 41 percent of the discrepancy between the desired and actual real money balances is eliminated in one quarter.

We have made an adjustment to the narrow definition of money, which distinguishes our model specification from the standard demand for money formulation by adding demand deposits of NBFIs to establish how the model compares with normal formulations of demand for money function. The results with that adjustment are reported in equations 1.1.2 and 2.2.2. The coefficients have the correct signs and the fit of the data to this specification is good, as indicated by the high values of R^2; the F-test statistic is significant and standard error of the estimates (SEE) relatively small. The results after this adjustment seem to indicate that NBFI deposits are substitutes for commercial banks deposits and should thus be subjected to monetary controls.

According to Lindsay:

> . . . so long as banks are taken to be a target of stabilization policy, so also must non-bank intermediaries be a target—particularly those deposit type intermediaries that compete most directly with banks for deposits (Lindsay, 1970, p. 518).

However, the coefficient of real money balances is low, especially in equation 2.1.2. The adjustment of the actual money stock of real balances to changes in demand for money is high and statistically different from zero at the 1 percent level.

Defining real balances in a broad sense, that is M1 plus quasi-money, the regression results are given in equations 1.1.3 and 2.2.3. The R^2 is high, suggesting our model specification fits Kenyan data very well. The real income variable is high and within the expected range of above 1.5 and statistically different from unity at the 1 percent level. The interest-elasticity of money is not significantly different from zero at the 5 percent and 1 percent levels and the opportunity cost of holding money relative to other real assets is statistically insignificant.

M3 was estimated and the results are reported in equations 1.1.4 and 2.2.4 of Tables 5 and 6. M3 is defined as M2 plus liabilities of NBFIs. The results again suggest that NBFI deposits could be substitutes for commercial banks as far as the general public are concerned. People treat deposits in NBFIs as part of their wealth. Therefore, the monetary authorities in Kenya should take into consideration the demand for money in NBFIs. Income-elasticity ranges between 1.9 and 2.1, which is higher than when money is defined as M1 plus quasi-money.[12] The results contained in Tables 5 and 6 are consistent with studies carried out elsewhere in developing countries (Wong, 1977; Adenkule, 1980; White, 1978).

Annual data covering the period under review were used to estimate our demand for money formulations. These results are presented as Appendix II. The results are uninteresting and not consistent with our *a priori* expectations. They are reproduced here for the curious reader. Throughout the adjusted $\bar{R}^2$ is invariably lower for all specifications than the one obtained when quarterly data were used. The opportunity cost of holding money *vis-à-vis* physical assets has the wrong sign though it is statistically significant at the 1 percent level. This is a surprising result because in Kenya financial markets where people could hold their wealth in assets other than money are not well developed.

Income elasticity is low when annual data are used, and in some specifications has unanticipated signs. In equations 4.4.1 and 4.4.4 the variable is not statistically different from zero at the 1 percent level. In equation 4.4.6 the variable is within the expected range but lower than when quarterly data are used. In equation 4.4.5, if real income increases by 100 percent, demand for real money balances rises by only 0.8, a disturbing result. The regression results using annual data as reported in Appendix II are different from those obtained using quarterly data. The results obtained using quarterly data are consistent with the theoretical prediction and fit our model specifications well.

The period under review was split into two to investigate the possibility of structural breaks resulting from the likely effect of the rapid growth of NBFIs on the functional form of demand for money and also to test the constancy (stability) of the estimated demand for money coefficients. Stability of any function depends upon the variables included in the function and the appropriate demand for money function which monetary authorities should target depends on a stability test.

The Chow test is used in this study to test stability of estimated coefficients and this test involves splitting the data into two parts and estimating each data set separately. In dividing the data into two we choose 1980 as a cut-off point because the period after 1980 is characterized by rapid growth of NBFIs' liabilities compared with the 1970s. We present the estimated coefficients of the two sub-periods and later discuss stability of these coefficients.

Period 1: 1973.1–1979.4 (All variables are in logs)

$$M1 = 1.075 + 1.291\,Y - 0.009\,\pi - 0.071\,RI + 0.542\,M1_{t-1} \quad (3.1)$$

$$(2.294)^{***}\ (3.729)^{***}\ (-0.379)\ (-1.097)\ (4.109)^{***}$$

$$\bar{R}^2 = 0.644,\ SEE = 0.0105,\ DW = 2.223,\ F = 15.1$$

$$M2 = 1.931 + 1.872\,Y - 0.058\pi - 0.109RI + 0.650\,M2_{t-1} \quad (3.2)$$

$$(12.552)^{***}\ (14.141)^{***}\ (-0.145)\ (-3.894)^{***}\ (4.247)^{***}$$

$$\bar{R}^2 = 0.852,\ SEE = 0.062,\ DW = 1.997,\ F = 17.9$$

$$M3 = 0.310 + 2.213\,Y - 0.032\pi - 0.041\,RI + 0.805\,M3_{t-1} \quad (3.3)$$

$$(1.293)\ (2.462)^{***}\ (-1.916)^{*}\ (-2.005)^{***}\ (5.448)^{***}$$

$$\bar{R}^2 = 0.914,\ SEE = 0.416,\ DW = 2.713,\ F = 21.9$$

The lagged real money balances are a statistically significant variable at the 1 percent level in this period and have the anticipated sign. The income elasticity of demand for money ranges between 1.2 and 2.2 in period one and is statistically significant at the 10 percent level in all specifications. Splitting the period of review into two does not change the effect of NBFI liabilities on demand for money, as shown by equation 3.3.

Regression results for the other period are:

Period II: 1980.1–1987.4 (All variables are in logs)

$$M1 = 0.662 + 1.200Y - 0.06\pi + 0.104RI + 0.696M1_{t-1} \quad (3.4)$$

$$(2.199)^{**} \quad (3.218)^{***} \quad (-3.166)^{***} \quad (1.249) \quad (7.747)^{***}$$

$$\bar{R}^2 = 0.938, \text{SEE} = 0.084, \text{DW} = 2.074 \; F = 19.4$$

$$M2 = 2.278 + 1.509Y - 0.026\pi + 0.156RI + 0.103M2_{t-1} \quad (3.5)$$

$$(2.372)^{**} \quad (2.034)^{**} \quad (-0.294) \quad (0.715) \quad (4.491)$$

$$\bar{R}^2 = 0.764, \text{SEE} = 0.339, \text{DW} = 2.283, F = 22.5$$

$$M3 = 2.057 + 1.424Y - 0.461\pi + 0.404\,RI + 0.187\,M3_{t-1} \quad (3.6)$$

$$(2.477)^{***} \quad (1.994)^{*} \quad (-0.638) \quad (1.886)^{*} \quad (1.926)^{*}$$

$$\bar{R}^2 = 0.871, \text{SEE} = 0.285, \text{D.W} = 2.286, F = 17.9.$$

The estimated coefficients in the second period as shown in equations 3.4–3.6 differ quite significantly with those of the first period. In this period, income elasticity of demand for money is more than unity and ranges between 1.2 and 1.5. However the coefficient is lower in this period than in the first period. The opportunity cost variable is statistically significant in only one equation while the interest rate variable not only has the wrong sign but is statistically insignificant throughout. These results are disturbing and probably capturing the wrong relationships especially the interest rate variable. Interpreting them is difficult since they do not conform to our *a priori* expectations. However the income elasticity coefficient indicates that, because of the liquidity problems NBFIs faced in the 1980s, wealth-holders started treating them as inferior to commercial banks while the level of interest which is fixed throughout the year by the authorities does not affect demand for money in this period.

The empirical results on demand for money when NBFIs are incorporated have indicated that NBFIs should be incorporated in monetary control. Since effectiveness of monetary policy depends on stability of demand for money, the study looked at the appropriate monetary aggregate for policy manipulation. This involved testing stability of M2 and M3 in order to gauge which of the two is appropriate for monetary policy. The stability methodology developed by Chow (1960) was applied. Residuals of the observed values and estimated coefficients were calculated and a comparison made with the standard errors of estimate (SEE). The residuals of M3 turned out to be very small compared with the standard errors of estimate. They did not indicate any significant shifts in demand for money, thus suggesting that M3 is a more stable function than M2. Thus, by incorporating NBFIs, monetary policy would be much more effective.

M3 is, therefore, the empirically appropriate functional form for demand of money in Kenya.

The demand for currency and deposits

There are no strong theoretical reasons to estimate the demand for components of real stock because by doing so we are not testing any theory. However, separate analysis of currency and deposits is important and has policy implications. This has also been done by Balino (1977) who argues:

> . . . are strong reasons to look at the demand for the components of money stock. The difficulties evidenced in the efforts to obtain a satisfactory aggregate demand for money are such reason . . . the analysis of currency and deposits separately is interesting in itself.

Another reason for estimating components of money stock is to find out whether the estimated coefficients differentiate in some way between deposits in banks and in NBFIs. This is a particularly relevant exercise to the subject at hand.

The components of money stock were estimated in non-linear functional form using both quarterly and annual data. The same explanatory variables used in estimating real money balances were used and the results are given in Table 7 and Appendix III. We discuss the most important results which yield better results in terms of plausibility of estimated coefficients. Demand for currency is positively related with income elasticity of demand and negatively related with interest elasticity and opportunity cost of holding currency. The long-run income elasticity of demand for currency is high (1.869) and statistically significant at the 1 percent level. The variable shows that if wealth of money holders increases by 10 percent, demand for currency increases by about 18. The coefficient of adjustment between actual and desired currency has the correct sign and is statistically significant at the 1 percent level, implying real currency in the previous period is an important explanatory variable in demand for currency.

In both equations 3.3.1 and 3.3.2 real income is significant at the 1 percent level and within the expected range, indicating that currency is held for transaction purposes. The rate-of-inflation variable has the anticipated sign. This shows that people reduce their holdings of currency and keep their wealth in other financial assets which do not depreciate because of inflation.

Long-run income elasticity of demand deposits and the short-run elasticity of time and savings deposits ranges between 1.5 and 2.3. The possible explanation for this trend is that when people's income increases they prefer to save their wealth for future transactions and for speculative reasons. The interest elasticity has the correct sign. The summary statistics, that is the adjusted $\bar{R}^2$, the standard error of the estimate, the DW and the F-test statistic, favour our specification of this monetary model.

Under the assumption that lags affect adjustment between actual and expected demand for currency and deposits, the results are equations 3.3.2, 3.3.4 and

3.3.6, respectively. As anticipated, the lagged real variables have the correct signs and are statistically significant at the 1 percent level. As can be seen in Table 7 the estimated coefficients differentiate between desposits in banks and NBFIs. Adding demand and savings deposits with NBFIs to those of the banking system, upon estimating we have the results as equations 3.3.1., 3.3.3. and 3.3.6. This adjustment improved the performance of the model. The estimated coefficients of these equations have the expected signs and are statistically significant at 1 percent, 5 percent and 10 percent levels. The income-elasticity of demand for the components of money stock is very high and significant at 1 percent level throughout.

Regression results for components of money stock using annual data are presented in Appendix III. Except in equations 5.5.5 and 5.5.6 the adjusted $\bar{R}^2$ is small. A surprising result is that the opportunity cost variable of holding currency, demand and time and saving deposits has an unanticipated sign and is significant at the 1 percent level throughout. The results confirm our earlier finding that lags affect the components of real money stock. The real income variable is unity in only three equations with the rest having not only a coefficient less than unity but an incorrect sign. An important finding is that regression results using annual data to estimate components of money stock as found before do not fit our model well and give distorting and unrealistic results.

V. Conclusion

The principal objective of this empirical study was to investigate the effect of NBFIs on the conduct of monetary policy in Kenya, paying special attention to the rapid growth of NBFI liabilities. An adjustment was made to the standard demand for money formulation by adding NBFI liabilities to both narrow and broad definitions of money and the model estimated in log-form to establish the impact of NBFI growth on demand for money.

The paper further looked at components of money stock which were currency, demand deposits and time and savings deposits in order to investigate whether the estimated coefficients differentiate in some way between deposits in banks and NBFIs. Kenyan data over the period 1973.1 to 1987.4 were used to estimate the coefficients. The main conclusions of this empirical study are:

1. Analysis of NBFI liabilities indicated a rapid growth. NBFIs compete favourably with commercial banks in saving mobilization and in the provision of both medium-term and long-term credit. People treat their deposits in NBFIs as part of their wealth.
2. Estimated coefficients after adding NBFIs deposit to both narrow and broad definitions of money suggest that NBFI deposits may be imperfect substitutes for commercial banks deposits. In addition, M3 was found more stable using the Chow test compared with M2. Thus, it would be wrong to use a demand for money function without considering liabilities of NBFIs. In addition, conduct of monetary policy without considering NBFIs will be erroneous and is likely to provide uncertain results. Lindsay argues that "confining monetary policy to banks (alone) thus may add inequality to ineffectiveness". Thus, any monetary policy aimed at stabilizing the economy should take account of the activities of NBFIs.
3. Lagged money balances are important explanatory variables for explaining variation of money from period to period. Real money balances in the previous period, therefore, play an important role in the portfolio decisions of money holders in Kenya. In addition, this study found that predictions on growth of money based on annual data will definitely be misleading because estimations using annual data did not give good results with policy implications throughout.

Appendix I

Data sources and description of variables

Data for this study were obtained from the following sources:

International Financial Statistics (IMF) various issues; Central Bank of Kenya, *Quarterly Economic Review* (various issues) and Central Bureau of Statistics, *Economic Survey* (various issues).

Variable	Description
M1	Currency plus demand deposits (narrow definition)
M1AD	M1 plus NBFI demand deposits
M2	M1 plus time and savings deposits (broad definition)
Y	Real income (constant 1981 prices). To transform income figures to a quarterly basis a mathematical interpolation method developed by Diz (1970) was used. Darrat (1985) has used the same technique to calculate quarterly income figures for Kenya.
π	Rate of inflation
RI	Treasury bill rate is used as proxy of interest rate. Since average rate of discount of treasury bills are available monthly we extracted data at the end of quarter
$M1_{t-1}$	M1 lagged one quarter
$M1AD_{t-1}$	M1AD lagged one quarter
$M2_{t-1}$	M2 lagged one quarter
$M3_{t-1}$	M3 lagged one quarter
CAA	Currency
CAA_{t-1}	Currency lagged one quarter
DEE	Demand deposits
DEE_{t-1}	Demand deposits lagged one quarter
TSS	Time and savings deposits
TSS_{t-1}	TSS lagged one quarter

Appendix II

Regression results for short- and long-run demand for money: Annual data, 1973–1987

Equation number	Dependent variable	Constant	Y	π	RI	MAD $_{t-1}$	M2 $_{t-1}$	M3$_{t-1}$	$\bar{R}^2$	SEE	DW	F
4.4.1	M1	0.723	–0.713	–0.123	–0.233				0.712	0.113	2.423	16.7
		(1.341)	(–1.613)*	(–3.414)***	(–8.14)*							
4.4.2[a]	MAD	2.351	0.03	0.272	–0.206	0.319			0.559	0.069	2.444	5.441
		(2.543)**	(1.948)*	(3.234)***	(–3.852)***	(1.452)*						
4.4.3	MAD	–3.077	1.124	2.508	–0.255				0.661	0.651	2.307	10.1
		(1.132)	(1.442)	(3.153)***	(–0.523)							
4.4.4[a]	M2	1.480	–0.03	0.379	–0.20		0.474		0.791	0.063	2.124	14.2
		(2.031)*	(–1.997)*	(4.364)***	(–4.209)***		(2.554)***					
4.4.5	M2	3.219	0.008	0.485	–0.217				0.686	0.077	1.610	11.2
		(10.057)***	(2.252)**	(5.183)***	(–3.772)***							
4.4.6	M3	–2.719	1.519	2.481	–0.252				0.665	0.639	2.298	10.3
		(–1.094	(2.434)**	(3.179)***	(–0.524)							
4.4.7[a]	M3	2.278	1.508	–0.152	–0.027			0.103	0.725	0.032	2.179	8.7
		(2.372)	(2.034)	(–2.714)	(–0.490)			(4.749)***				

Key

a Short-run demand for money equation
t Statistic in parentheses under the coefficients
* Statistically significant at 10 % level
** Statistically significant at 5 % level
*** Statistically significant at 1 % level

Appendix III

Regression results for components of money stock: Annual data, 1973–1987

Equation number	Dependent variable	Constant	Y	π	RI	CAA $_{t-1}$	DEE $_{t-1}$	TSS $_{t-1}$	R^2	SEE	DW	F
5.5.1	DEE	3.626	1.018	0.218	–0.246				0.579	0.079	1.999	7.4
		(0.995)***	(2.533)**	(0.254)**	(–4.135)							
5.5.2[a]	DEE[b]	0.721	1.224	–0.224	0.324	0.869			0.879	0.089	2.867	5.1
		(3.142)***	(2.583)**	(–3.25)***	(3.220)***	(3.171)***						
5.5.3	CAA	1.707	–0.003	0.424	–0.151				0.577	0.091	1.849	4.8
		(2.847)***	(–0.064)	(2.822)***	(–2.193)**							
5.5.4[a]	CAA[b]	0.919	0.005	0.343	–0.159		0.342		0.595	0.086	1.765	5.6
		(1.233)	(0.124)	(2.896)***	(–2.358)**		(1.216)					
5.5.5	TSS[b]	1.131	1.023	–0.713	–1.241				0.971	0.034	2.173	14.3
		(3.123)***	(2.113)*	(–3.434)***	(–1.971)*							
5.5.6[a]	TSS	1.773	–0.198	0.489	–0.22			0.605	0.941	0.065	1.972	58.4
		(1.971)*	(–0.649)	(4.382)***	(–5.079)***			(5.137)***				

Key

a Short-run demand for Components of demand equation
t Statistic in parentheses under the coefficients
* Statistically significant at 10 % level
** Statistically significant at 5 % level
*** Statistically significant at 1 % level
b Demand and savings deposits with NBFIs included in the estimations of these equations.

Notes

1. This section draws heavily on Glahe (1977).
2. See for example Adenkule (1980), Wong (1977), White (1978), Ghatak (1981), Nganda (1985), Aghevli (1980), Khan (1977).
3. Pathak, for example, does not provide the methodology he used to find that demand for money function in Kenya is stable.
4. Currently there are 54 NBFIs transacting financial business in Kenya.
5. Central Bank of Kenya (1989), Charts 4.2 and 4.5.
6. Central Bank of Kenya (1989), page 15.
7. The expected rate of inflation was computed using the adaptive expectation model.
8. Darrat (1985) in his Kenyan study used foreign interest rate and found the variable statistically significant.
9. This model specification is derived from Theil (1971).
10. A similar specification to this one is that by Balino (1980).
11. This research paper was done in 1989. Available published data was up to the fourth quarter of 1987.
12. Mwega *et al.* (1990) estimated M3 and found real income statistically significant and ranging between 1.20 and 1.27.

References

Adenkule, J.O. 1980. "The demand for money: Evidence from developed and less developed economies." In Coats, J.W., and Khatkhate, D.R. (eds.), *Money and Monetary Policy in Less Developed Countries: A Survey and Evidence*, Pergamon Press, Oxford, 255–278.

Aghevli, B. 1980. "Effects of banking development on demand for money." In Coats, J.W., and Khatkhate, D.R. (eds.), *Money and Monetary Policy in Less Developed Countries: A Survey and Evidence*, Pergamon Press, Oxford, 241–254.

Balino, T.J.T. 1980. "The demand for money and its components in Argentina: Annual estimation 1935–69." In Coats, J.W., and Khatkhate, D.R. (eds.), *Money and Monetary Policy in Less Developed Countries: A Survey and Evidence*, Pergamon Press, Oxford, 279–298.

Bolnick, B.A. 1975. "A note on behaviour of the proximate determinants of money in Kenya." *Eastern Africa Economic Review.*

Central Bank of Kenya. 1989. *Quarterly Economic Review,*. January–March, Nairobi.

Chow, G.C. 1960. "Tests of equality between sets of coefficients in two linear regressions." *Econometrica* 28: 591–605.

Chow, G.C. 1966. "On the long-run and short-run demand for money." *Journal of Political Economy* 74(2): 111–131.

Darrat, A.F. 1985c. "The demand for money in a developing economy: The case of Kenya." *World Development* 13: 1168–1170.

Lindsay, R.J. 1970. "Bank and Non-Bank financial intermediaries and monetary policy," in *Financial Institutions and Markets*, Houghton Mifflin, New York, 513–527.

Diz, A.C. 1970. "Money and prices in Argentina, 1935–62." In Meizelman, D. (ed.) *Varieties of Monetary Experience.* University of Chicago Press, Chicago.

Ghatak, S. 1981. *Monetary Economics in Developing Countries.* Macmillan, London and Basingstoke.

Glahe, F.R. 1977. *Macro Economics: Theory and Policy.* Second edition. Harcourt Brace Jovanovich, New York.

Khan, M.S. 1977. "Variable expectations and the demand for money in high inflation countries." in *Money and Monetary Policy in less Developed Countries: A Survey and Evidence*, ed. by Coats, J.W., and P.R: Khatkhate. 1980. (Pergamon Press, Oxford) 307–327.

Luckett, D. G. 1984. *Money and Banking.* McGraw-Hill, Singapore.

Mwega, F.M., Ngola, S.M. and Mwangi, N. 1990. "Real interest rates and the mobilization of private savings in Africa." AERC REsearch Paper No.2. Initiatives Publishers, Nairobi.

Nganda, B.M. 1985. "An economic analysis of monetary relationships in Kenya, 1968–1983." Unpublished MA Research Paper, Department of Economics, University of Nairobi.

Pathak, D.S. 1981. "Demand for money in developing Kenya: An econometric study, 1968–78."*Indian Economic Journal* 29: 10–16.

Theil, H. 1971. *Principles of Econometrics*. John Wiley, New York.

White, W.H. 1978. "Improving the demand-for-money function in moderate inflation." *Staff Paper* 25: 564–607.

Wong, C. 1977. "Demand for money in developing countries: Some theoretical and empirical results." *Journal of Monetary Economics* 3: 59–86.

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